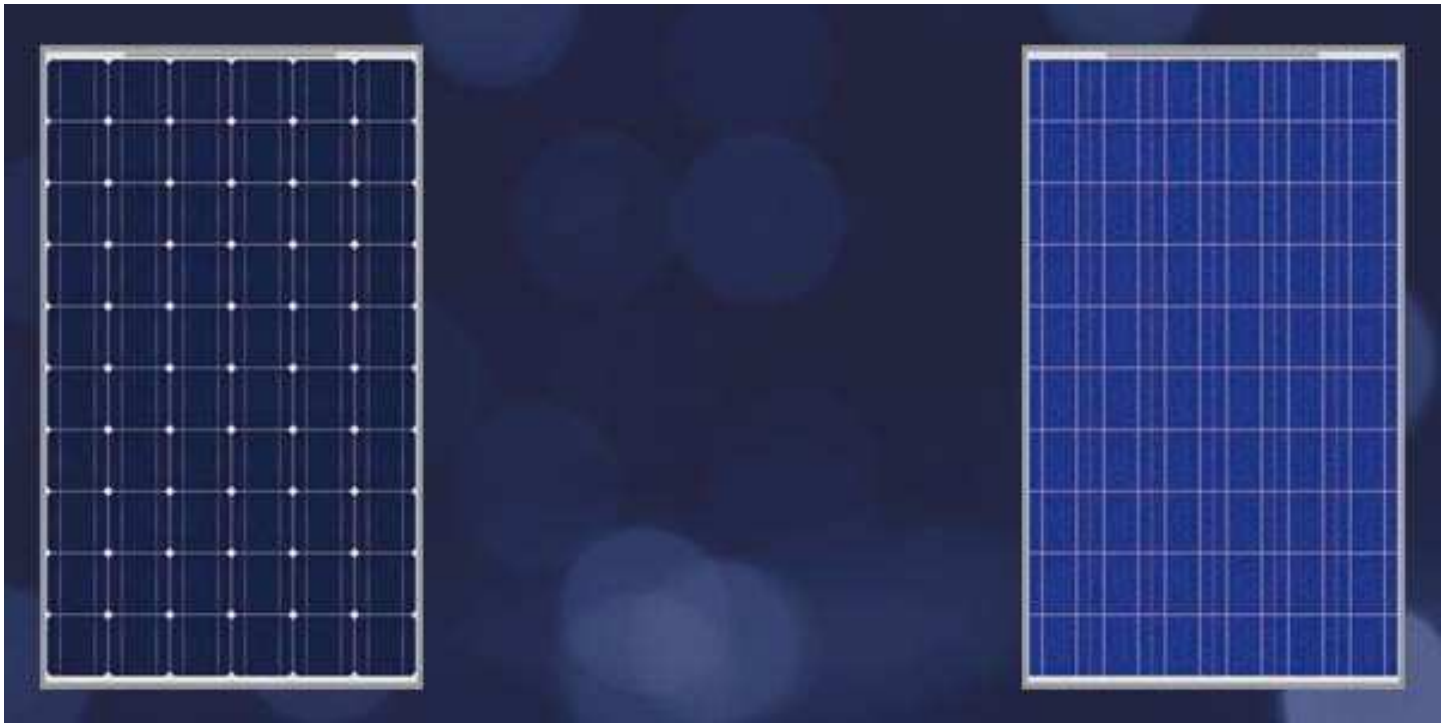
PHOTOVOLTAIC MODULES: USER MANUAL



01 Photovoltaic Modules Eurener

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SAFETY INSTRUCTIONS

We strongly recommend to fully read and understand the following instructions as well as the modules back sticker before handling or connecting your photovoltaic module.

Eurener modules are qualified for application class A: Hazardous voltage (IEC 61730: higher than 50V DC; EN 61730: higher than 120V), hazardous power applications (higher than 240W) where general contact access is anticipated (modules qualified for safety through EN IEC 61730-1 and -2 within this application class are considered to meet the requirements for safety class II).

Warning: Any defect in Eurener photovoltaic modules produced by non compliance of the following instructions may void the warranty. Eurener S.L. shall not be responsible for unintended use or mishandling of its manufactured products.

CERTIFICATES AND WARRANTY

- Qualified, IEC 61215
- Safety tested, IEC 61730
- Periodic Inspection

Certificado ISO 9001 por

✓ISO 9001:2008 Quality Management System Certified by Bureau Veritas

✓ ISO 14001:2001 Environmental Management System Certified by Bureau Veritas

Following all valid quality and environmental norms, Eurener counts with recognition of the most prestigious certification organisms such as TÜV Rheinland, contracted since 2007 to perform IEC Standards inspections.

CERTIFICATES AND WARRANTY

Eurener **photovoltaic modules warranty** ensures the following aspects: The product warranty provided by Eurener for photovoltaic modules implies compliance with the following points:

1. **Total absence of manufacturing defects** over a 12 years period, starting on sale date to the first buyer (*excluding connectors and interconnection cables which are not intrinsic part of the module)*.

2. **Rated power supply** over a minimum period of 25 years. We proudly guarantee a power loss that does not exceed 1,75% after the first year, and then a linear regression of 0,75% per year during the first 25 years.

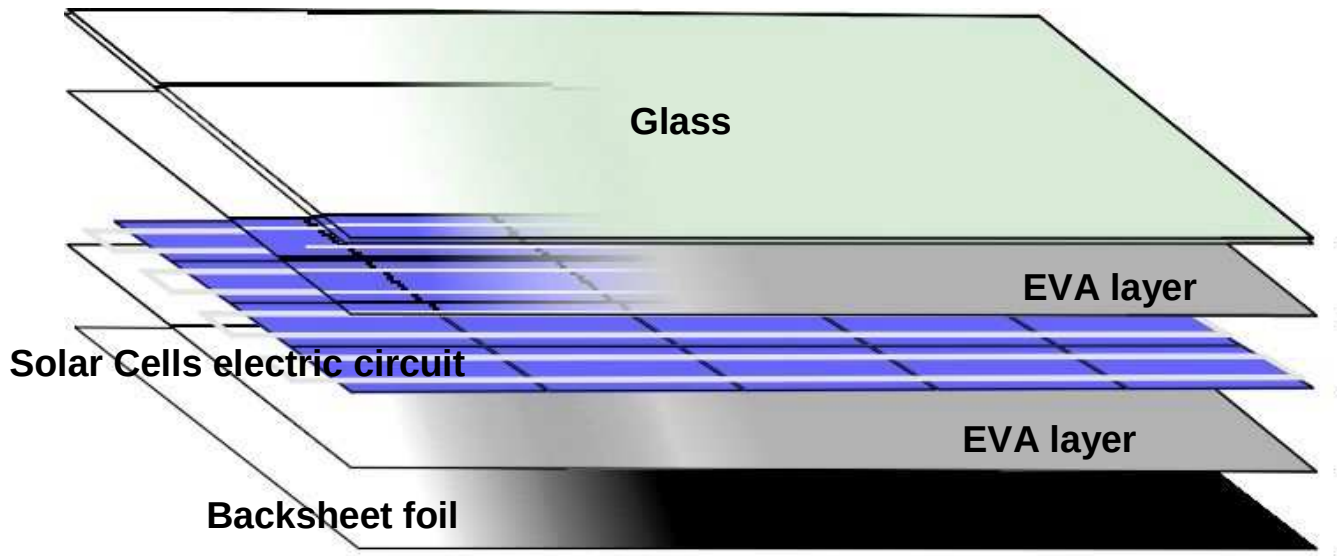
MANUFACTURING DETAILS

Photovoltaic modules are made of the following materials.

- ✓ **Frame:** Made of anodized aluminium, provides a perfect clamping system to the supporting structure.
- ✓ **Glass:** low iron, 4mm thick tempered glass that provides stiffness to the laminate and protection for the active side of the solar cells.
- ✓ **EVA:** (Ethyl Vinyl Acetate): Cells circuit encapsulating material.
- ✓ **Solar Cells:** Made of High efficiency crystalline silicon. They are the components that generate electricity within the module.
- ✓ **Back sheet foil**: Specially designed multi-layer foil, it provides electrical insulation to the rear side of the module.
- ✓ **Junction box**: IP 65 specified, provides a safe electrical connection between the module and the overall installation.

MANUFACTURING DETAILS

:: Schematic of a photovoltaic laminate ::



:: Junction box :: By-pass diodes ::

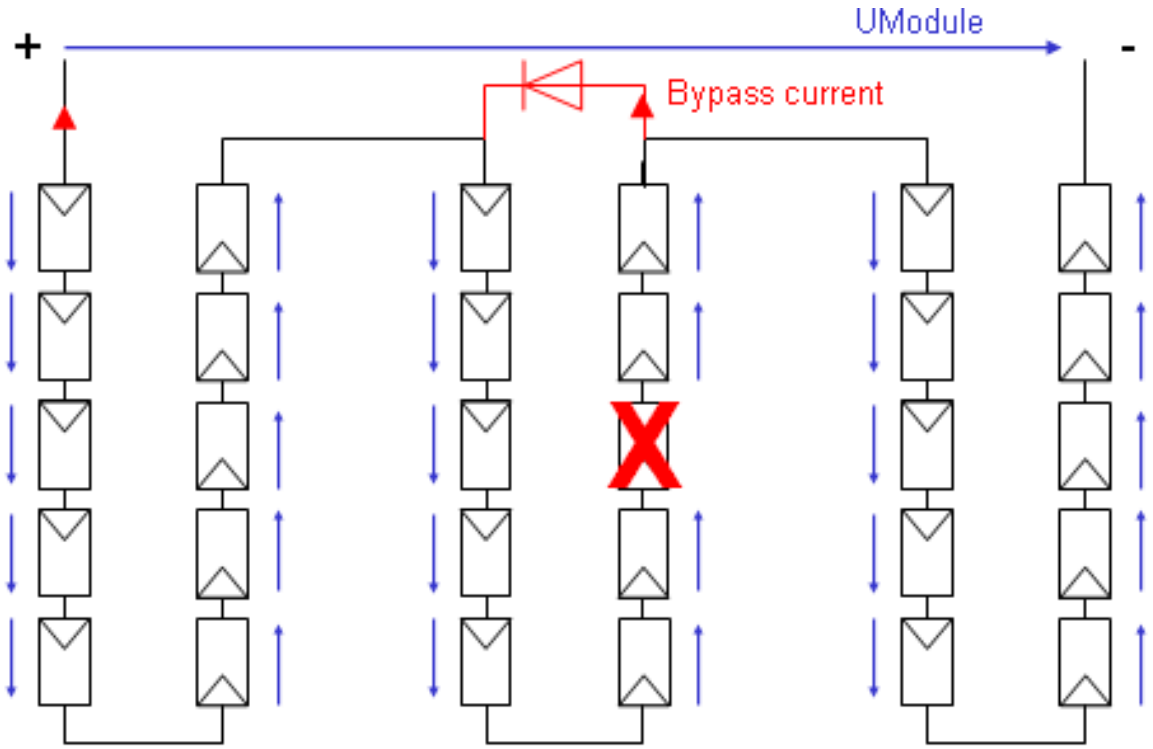
Photovoltaic modules are protected by by-pass diodes, a semiconductor device that provides very fast commutations between forward and reverse conducting state (less than 1ns in small devices of 5 mm diameter).

These diodes protect the module against cells partial shading, avoiding the module to completely stop functioning.

CAUTION: For security reasons, it is important not to extract diodes from the junction box.

In case of by-pass diodes malfunction, these should be replaced by original diodes. Modules affected should remain disconnected during the time needed for replacement, to ensure that the photovoltaic field remains in open circuit.

:: Schematic of the By-pass diode protection in a module ::



IMPORTANT FIELD DESIGN CONSIDERATIONS

Under normal conditions, a photovoltaic module can produce more current and/or voltage than reported at standard test conditions.

Accordingly, the values of Isc and Voc labeled on a module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output.

1. Intensity / Current consideration:

• Eurener photovoltaic modules are designed to sustain reverse current ratings up to 12A. Observe this maximal reverse current bearing capacity when connecting modules in parallel. If the possible reverse current through a module might become higher than this value, appropriate diodes must be used in each module or string of modules connected in parallel.

• Only connect modules with the same rated output current in series.

• Under no circumstances any Eurener module shall be exposed to concentrated sunlight.

2. Tension / Voltage consideration:

• Only connect modules or series combinations of modules with the same voltage in parallel.

• With a serial interconnection of modules, the sum of the open circuit voltage at Standard Test Conditions (Voc @ STC) must not overtake the maximum system voltage indicated.

Warning: Due to the voltage increase induced by very low temperature ranges, the maximum number of modules will have to be corrected according to the place and correction parameters stated in the formula below. The lowest temperature of the region where the photovoltaic modules will be installed must be taken into account.

$$\text{maximum number of modules} = \frac{\text{Maximum tension of the system}}{V_{oc25^{o}c} + ((T^{a} - 25) \times n^{o}\ \text{cell} \times (-0.00215))}$$

MOUNTING INSTRUCTIONS

❑ The positioning of the module should be done in accordance with the indications established by the technician responsible for the technical project or official project. The inclination and orientation angles should be respected. Projected shades towards the active area should be avoided, as they generate decrease in the electrical production.

❑ Safety distances between lines of modules must be respected to avoid overheating. Note that an excess rise of temperature causes efficiency losses in the module.

❑ Grid connected installations as well as stand alone installations must be done in accordance with the recommendations and requirements established as per the local Electro technical Regulation for Low Tension.

❑ The use of structural elements such as flanged type locks or cable crimping clamps to fix the cables must be avoided. In any case, excessive tension of the connecting cables must be avoided.

MOUNTING INSTRUCTIONS

Actions to take into account when fixing modules onto a supporting structure:

Mechanical installation on a supporting structure must be done in accordance with the safety conditions established by the local regulation for low tension and legislation on labour risk prevention.

❑ The cable crimping press from the junction box should be oriented downward in the same direction as the inclination.

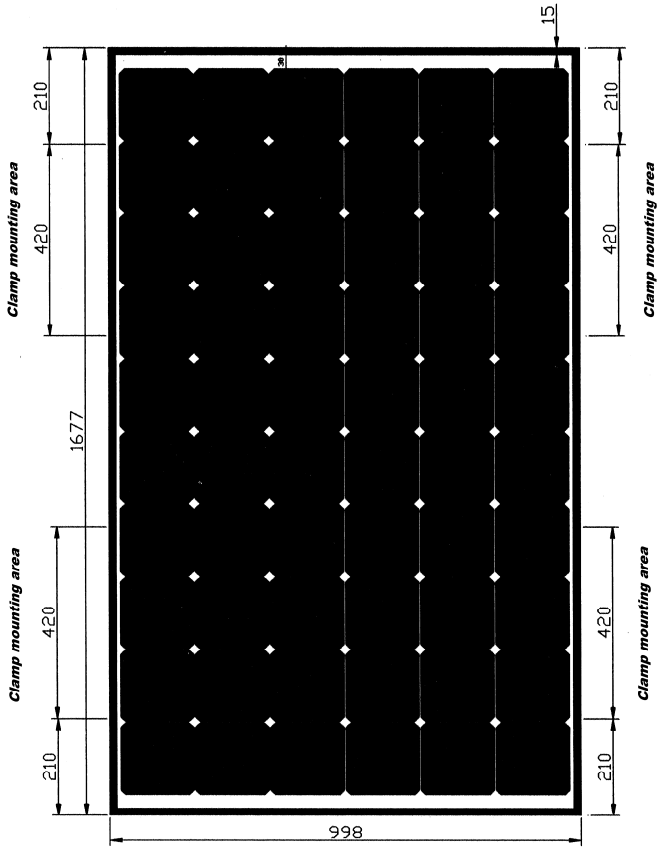
❑The mounting structure and hardware must be made of durable, corrosion- and UV-resistant material.

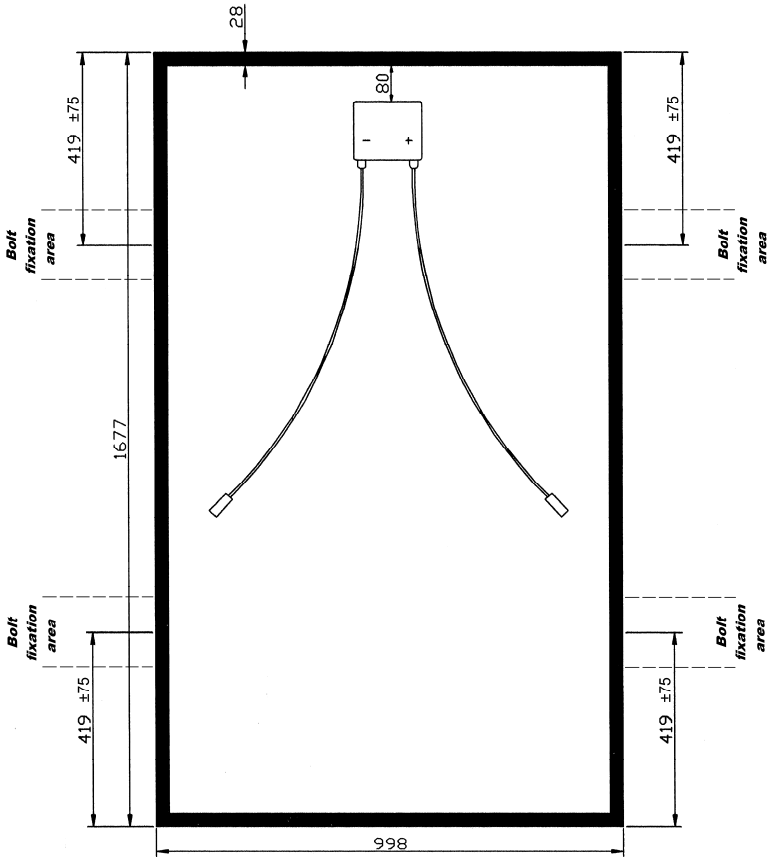
❑The mounting system must be capable of securely fixing modules exposed to uplift or load pressures of more than 2'400 N/m².

❑Either clamps or bolts are suitable for mechanical fixation on the supporting structure, although clamps are highly recommended as they do not require drilling of the aluminum frame. The torque on the clamp bolt shall be around 8-10Nm.

❑A minimum of 4 fixation points shall be used, see the drawings facilitated on next page for location details.

MOUNTING INSTRUCTIONS





INSTRUCTIONS OF USE

❑ Eurener modules are supplied with IEC certified cables and connectors for serial electrical connections, which technical specifications are as follows:

- 4mm², 1m long copper conductor,
- Inner and sheath insulation made of polyolefin reticulated compound
- Maximum conductor temperature: 120ºC / Maximum ambient Tº: 60ºC

❑ For additional extension cables use only suitable cables

❑Since Eurener photovoltaic modules generate DC power, electrical polarities must be respected. These polarities come indicated with the + sign for the positive part, and the - sign for the negative part, both marked on the connectors.

Negative

Positive

INSTRUCTIONS OF USE

❑ Manipulation, installation and maintenance of photovoltaic modules must be carried out by qualified technicians. In any case, the technicians manipulating the installation must comply with the safety norms in force and use protective clothes with isolation superior to 1000 V.

❑ Avoid modules installation in rainy or humidity conditions.

❑ Do not install the module in case of breakage of the glass cover or any other structural element.

❑ Avoid leaning on the module or overcharging it.

❑ If Eurener modules are installed in or on roofs, an appropriately rated fireproof underlay is needed.

❑ Do not use mirrors or other hardware to artificially concentrate sunlight on the module.

- Protective elements between modules series and inverter must be used as per the local norms and safety regulations. Typical protective elements such as fuses or magneto caloric devices shall display breaking capacity superior to the intensities of the series of modules.
- The non installation of this type of devices could cause that, in case of error in polarity connections, the inverted series act as energy receptors and damage live parts of the module.
- Avoid the installation of photovoltaic modules next to sources of toxic, corrosive or inflammable vapours.
- Do not manipulate any component of the module.
- Do not remove the label with technical specifications.
- Avoid tearing the back sheet foil with assembly tools.

❑ Do not deposit broken modules in garbage containers or landfills because it could be dangerous. In case of breakage, electrical malfunction and in general any event that could cause the end of the module useful life, please contact your module supplier for adequate elimination and/or recycling in accordance with European norms.

Warning: **Any failure in the module produced by the non-compliance with the instructions of use contained in this manual may void our product warranty.**

No responsibility will be assumed by Eurener S.L. in the event of an inadequate module manipulation.

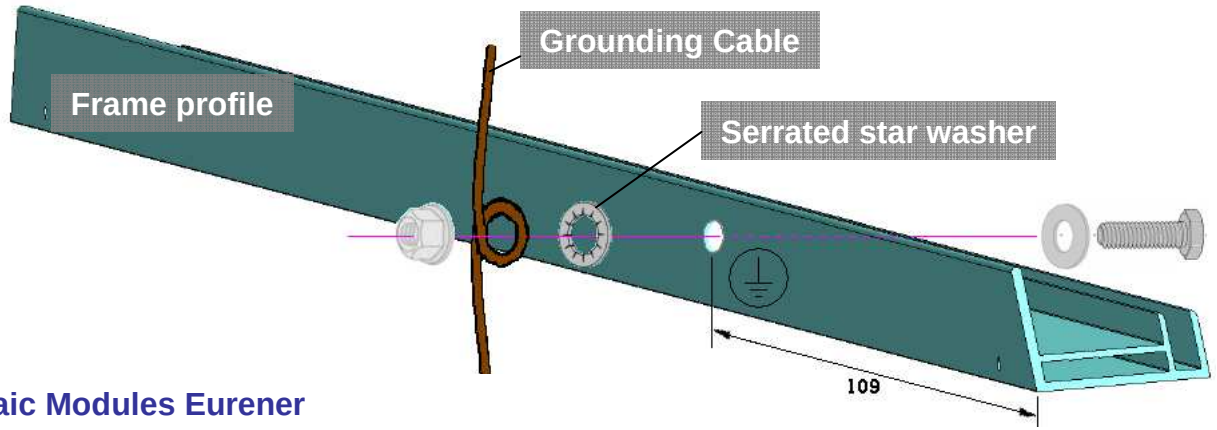
GROUNDING

❑ Functional grounding is not foreseen for Eurener photovoltaic modules. If it is performed, local electric codes and regulations have to be observed, and used grounding means have to be isolated from live parts by reinforced insulation.

❑In any case the grounding screws, bolts or other parts have to be used separately from the module mounting parts. The grounding holes should be situated as per the drawing facilitated below.

❑ For frame grounding: a bolded or screwed connection is required, it incorporates:

- a serrated stainless steal star washer under the screw head so as to penetrate the nonconductive coating of the anodized frame
- 2 or more screws or 2 full threads of a single screw shall engage the metal



MAINTENANCE CONDITIONS

- ❑ It is recommended to periodically clean the module with water or non abrasive detergent, avoiding the use of high pressure cleaning equipments. Perform an annual control of the electrical connexions state, cables, fixing elements and supporting structures.
- ❑ Check technical features of the modules to verify its efficiency.
- ❑ Visually inspect the photovoltaic modules in order to detect hot spots, delaminations, colour changes of the cells, broken glass, etc.

Warning: **No responsibility will be assumed by Eurener, S.L. for a possible loss of efficiency nor will it be considered that there is a defect in production of the module supplied if it is due to the non-compliance with these instructions of use and maintenance.**

TECHNICAL SPECIFICATIONS

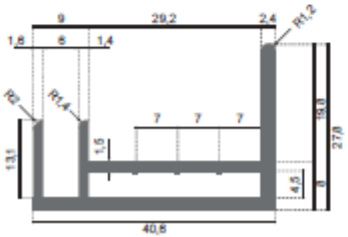
MEPV 220-250 Modules

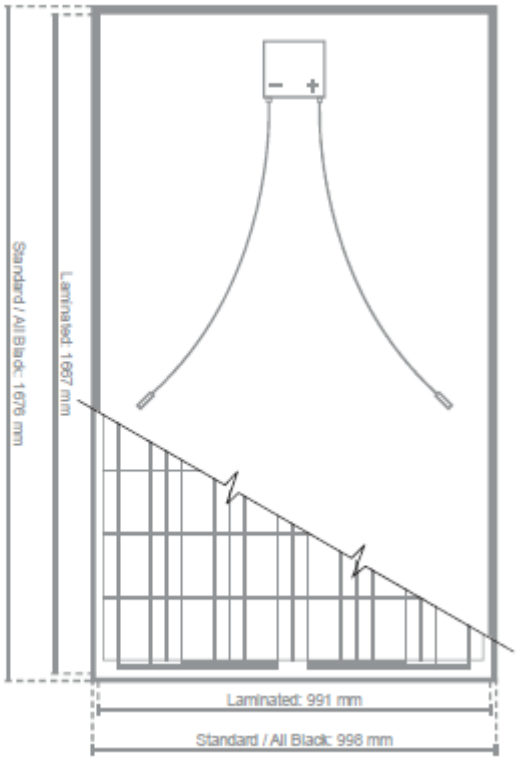
TECHNICAL SPECIFICATIONS

Frame (saving laminated module)
Silver anodized aluminium 0,015 mm
Robust and resistant to corrosion
Water drainage ori□ces
Built-in plug
Connection box
Sealed, robust and wide for heat dissipation
IP65 according to IEC 60529
Diodes by-pass built-in (3) for protection of the partial shading
Connector MC4, easy and rapid connection
Cables 1.0 meter length and 4mm² section
In□ammable capacity in accordance with UL 94-5V
Frontal
4 mm tempered glass
Textured, extra-clear, with low iron content
Solar cells
60 cells monocrystalline silicon / 6,2" / 156x156 mm
Encased cells
EVA (ethylen-vinyl-acetate)

Weight and dimensions (L x W x D) +/-2 mm
Standard / All Black: 22 Kg 1676 x 998 x 41 mm
Laminated: 18,5 Kg 1667 x 991 x 5,8 mm
Packaging
Pallet of 25 modules approved by AIDIMA (independent Institute)
Overcome horizontal impact, rotational fall and dynamic compression testing

Frame section (in mm):





TECHNICAL SPECIFICATIONS

Standard / All Black / Laminated	MEPV 214	MEPV 220	MEPV 225	MEPV 230	MEPV 235	MEPV 240	MEPV 245	MEPV 250
Nominal power, Pmpp	214 W	220 W	225 W	230 W	235 W	240 W	245 W	250 W
Tolerance, Pmpp	0 / +3%	0 / +3%	0 / +3%	0 / +3%	0 / +3%	0 / +3%	0 / +3%	±3%
Area of the module	1,67 / 1,67 / 1,65							
Module ef□ciency	12,80%	13,16%	13,46%	13,78%	14,08%	14,35%	14,67%	14,95%
Isc	7,94 A	8,12 A	8,26 A	8,41 A	8,52 A	8,47 A	8,76 A	8,70 A
Uoc	36,42 V	36,60 V	36,78 V	36,90 V	37,08 V	37,56 V	37,24 V	37,47 V
Impp	7,33 A	7,52 A	7,67 A	7,83 A	7,92 A	8,01 A	8,21 A	8,30 A
Umpp	29,20 V	29,27 V	29,36 V	29,44 V	29,73 V	29,79 V	29,85 V	30,12 V
Maximum voltage	1000 V							
α Isc	0,045% / °C / 0,08% / °C / 0,045% / °C							
β Uoc	- 0,53% / °C / -0,34% / °C / - 0,53% / °C							
γ Pmax	- 0,38% / °C / -0,44% / °C / - 0,38% / °C							
Temperature range	- 40°C to +85°C							
NOCT	44°C ± 2°C							

Data measured in standard test conditions: Radiation of 1000 W/m^2, spectrum AM 1.5 and cell temperature of 25 ºC

These are typical ratings, always refer to a module back sticker for detailed electrical ratings

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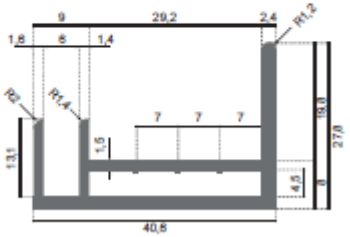

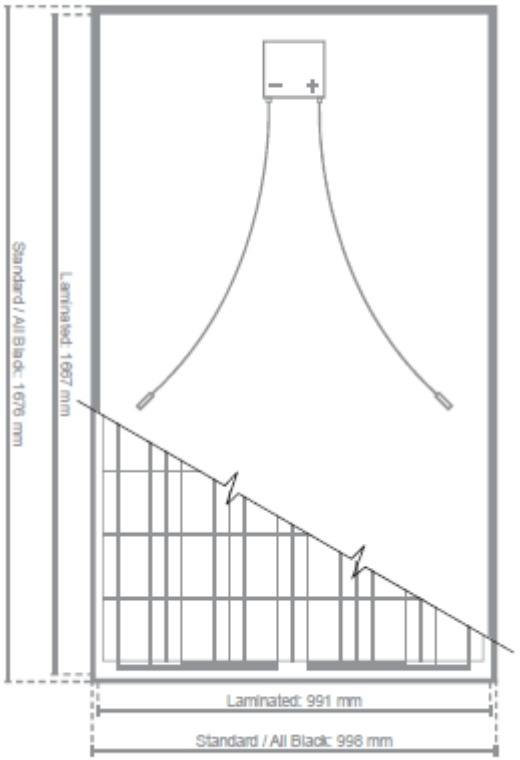

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Nominal power, Pmpp	214 W	220 W	225 W	230 W	235 W	240 W	245 W	250 W
Tolerance, Pmpp	0 / +3%	0 / +3%	0 / +3%	0 / +3%	0 / +3%	0 / +3%	±3%	±3%
Area of the module	1,67 / 1,67 / 1,65							
Module ef□ciency	12,81%	13,18%	13,47%	13,74%	14,08%	14,35%	14,65%	14,94%
Isc	8,02 A	8,06 A	8,15 A	8,25 A	8,40 A	8,52 A	8,63 A	8,69 A
Uoc	35,94 V	36,42 V	36,84 V	37,08 V	37,32 V	37,51 V	37,79 V	37,83 V
Impp	7,29 A	7,40 A	7,52 A	7,66 A	7,83 A	7,97 A	8,13 A	8,17 A
Umpp	29,40 V	29,79 V	29,96 V	30,01 V	30,07 V	30,10 V	30,14 V	30,64 V
Maximum voltage	1000 V							
α Isc	0,075% / °C / 0,08% / °C / 0,075% / °C							
β Uoc	- 0,312% / °C / -0,33% / °C / - 0,312% / °C							
γ Pmax	- 0,405% / °C / -0,43% / °C / - 0,405% / °C							
Temperature range	- 40°C to +85°C							
NOCT	44°C ± 2°C							

Data measured in standard test conditions: Radiation of 1000 W/m2, spectrum AM 1.5 and cell temperature of 25 ºC

These are typical ratings, always refer to a module back sticker for detailed electrical ratings

CONTACT DETAILS

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